THE ARCHITECTURAL DISCOVERIES OF 1901 AT STONEHENGE.

By Detmar J. Blow.

Read before the Royal Institute of British Architects, Monday, 20th January 1902.

In accepting your kind invitation to show you the result of last year's work at Stonehenge, I was hopeful that it might interest and amuse you, but unfortunately I have grown sadder and wiser in following the archæological scent—a never-ending and alluring pleasure to the hunter, though there be never a kill, and my only hope is in my firm belief in your generosity and your English appreciation of these sports.

I will first say a few words about the archæological investigations undertaken at Stonehenge in 1600 by one of the greatest masters of our art, though without any really satisfactory result. Inigo Jones's valuable *Discourse of Stonehenge Restored* was drawn up by direction of King James I. in the year 1620, though not published till after the author's death. The following is his own narration:

"Being naturally inclined in my younger years to study the Arts of Design, I passed into foreign parts to converse with the great masters thereof in Italy, when I applied myself to search out the Ruins of those ancient Buildings which, in despite of time itself and violence of Barbarians, are yet remaining. Having satisfied myself in these, and returning to my native country, I applied my mind *more particularly* to the study of architecture. Among the ancient monuments whereof found here, I deemed none more worthy the searching after than this of Stone-henge, not only in regard of the founders thereof, the *Time* when built, the

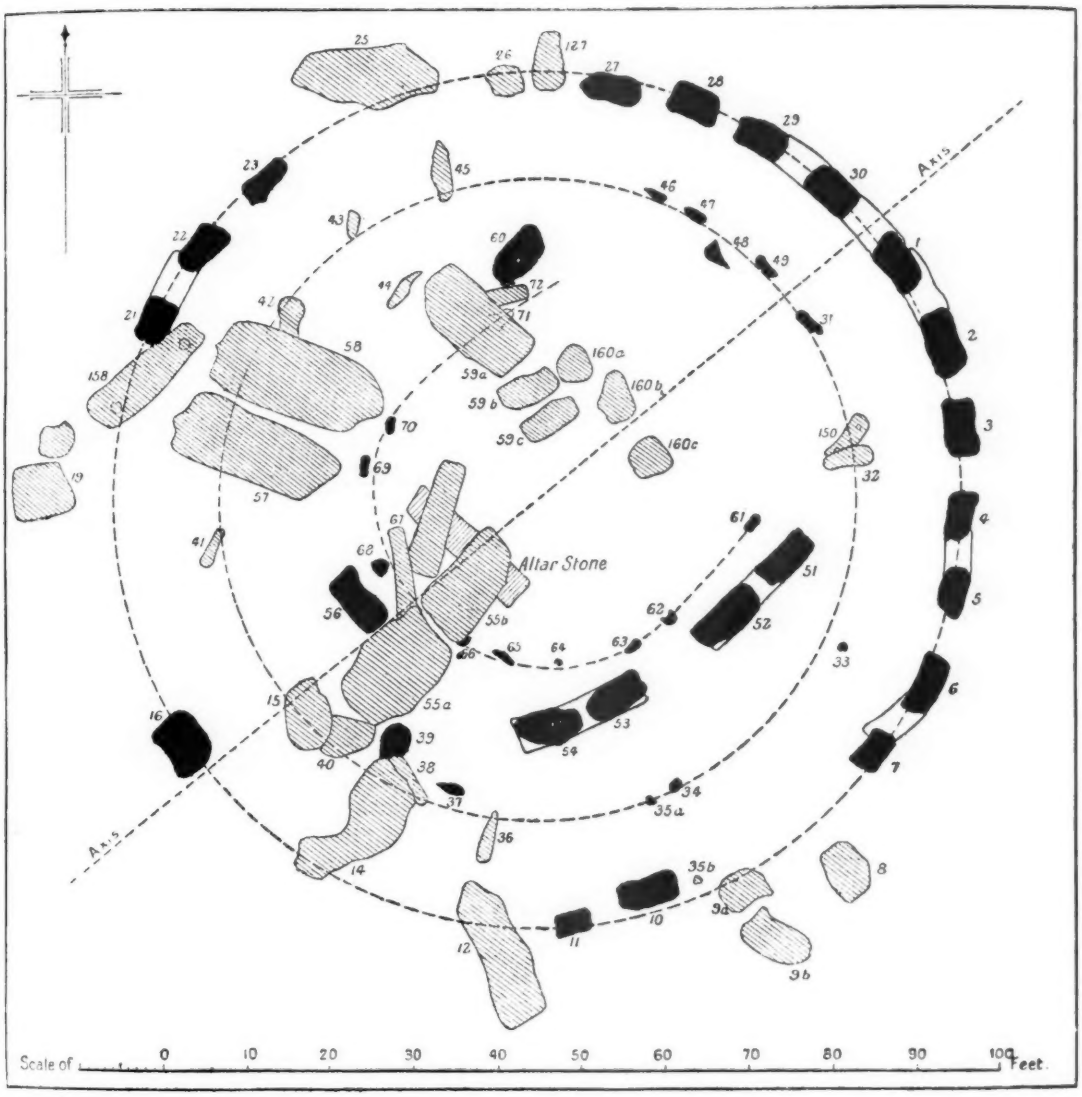
Work itself, but also for the rarity of its invention, being different in form from all I had seen before; likewise of as beautiful proportions, as elegant in order and as stately in Aspect as any. King James, in his progress the year 1620, being at Wilton, and discoursing of this Antiquity, I was sent for by the Right Honourable William, then Earl of Pembroke, and received there His Majesty's commands to produce, out of mine own practice in architecture and experiences in antiquities abroad, what possibly I could discover concerning this of Stone-henge."

After much reasoning, and quoting a long series of authorities, he concludes at last that this ancient and stupendous pile must have been originally a Roman temple inscribed to Coelus, the senior of the heathen gods, and built after the Tuscan order. Inigo Jones's notion was warmly attacked by Dr. Walter Charleton in a treatise called *Chorea Gigantum*, which was published in 1663, and here the doctor is very positive that this extraordinary monument was erected by the Danes, and he caused a copy of Inigo Jones's discourse to be transmitted to Olaus Wormius, the celebrated antiquary of Denmark, and Wormius returned his opinion of Stonehenge in several letters to Dr. Charleton. From the authorities and arguments produced in these letters, the doctor drew up his treatise, in which he maintains that this "ruinous fabric" was in reality of Danish origin. The world, however, did not generally come into the doctor's sentiments, though Sir William Dugdale is said to have approved of them in private conversation, and Dryden wrote an elegant panegyric to the author upon his performance. This renewed the controversy and gave occasion to John Webb, to whom we owe the original publication of Inigo Jones's book, to vindicate the opinion and memory of his kinsman Jones, in a tract of his own composition which he calls *A Vindication of Stonehenge restored; wherein the Roman architecture is discussed.*

Mr. Samms, in his *Britannia*, will have this structure to have been Phœnician; Mr. Aubrey thinks it was British, and yet, if the true old writing of the name be Stanhengest, as the *Monasticon* seems to tell us, "I cannot see," says Bishop Nicholson, "why the Saxons may not have as just a title as any to the honour of it." There is a manuscript treatise said to have been written upon this subject by one John Gibbons, and it is possible this gentleman may have a different notion from all the rest.

William Stukeley, in the preface to his book, discusses the *Discourse* of Inigo Jones, and wonders that the publisher of that work did not think of a very easy method to convince himself that he was in error. If Stonehenge is a Roman work, it would certainly have been built by the Roman scale; had he reduced his own measures to that standard, he would have seen the absurdity of his opinion. When Stukeley examined the dimensions of Stonehenge he found that, as he surmised, they were all fractions in the Roman scale, undoubted evidence that the Romans had no hand in building it.

"The Wiltshire Downs," says Stukeley, "or Salisbury Plain (as commonly called) for extent and beauty is one of the most delightful parts of Britain, but of late years" (that is, in 1740) "great encroachments have been made upon it by the plough, which threatens the ruin of this fine champain, and of all the monuments of antiquity thereabouts. Though Stonehenge be the proudest singularity of this sort in the world as far as we know (the Westminster Abbey of that period), yet there are so many others manifestly formed upon the same or kindred design, by the same measure and for the same purpose, all over the British Isles that we can have no room for doubt of their being made by the same people. These are innumerable from the Land's End in Cornwall to the utmost northern promontory in Scotland, where the Roman power never reached. They are circles of stones, often rude, of different diameters upon elevated ground, barren, open heaths and downs; chiefly made up of stones taken from the surface of the ground. There are no remembrances of the founders,



The numbering of the stones is that adopted by Mr W. M. Flinders Petrie.

Stones standing on 30th December 1900

Stones recumbent on same date.

From *The Times*, 9th April 1901.

FIG. 1.

any other than a tradition of their being sacred; that they were high places of worship, that there is a medicinal virtue in them (such as in lime stones in Ireland, Abbeyleix), that they were made by the Irish, and that they were brought from Africa; and in many places express remembrance and name of Druids remain."

Stonehenge stands in the middle of Salisbury Plain, between the River Avon to the east and a brook that runs into the Wylley on the west. The site itself is some 500 feet above the level of the streams, and from it the view extends almost across the shire, in one direction to old Sarum Castle, and in another towards Devizes, the horizon bounded by "the long green rollers of the down, an image of the deluge ebb." The turf of the temple floor is soft and springy and thick with herbs and flowers—thyme, bugloss, eyebright, agrimony, and wildbasil. The grass is bitten close by flocks of sheep, and nests of plovers and skylarks are scattered over it. The monument has stood here, and seen the rise and fall of more than one civilisation—sometimes the object of archæological inquiry, at others lost and forgotten (for in the Roman occupation it was not recorded).

The great monolith called the Leaning Stone is the largest in England, Cleopatra's Needle excepted. It was one of the pillars of the highest trilithon, and stood behind the altar stone, over which it leant at an angle of 65 degrees, and resting at one point against a small stone of syenite. Half-way up it had a fracture one-third across it. The weight of stone above this fracture was a dangerous strain on it. It has now been brought to a vertical position. This was done in the following manner: A strong cradle of 12-inch square baulks of timber was bolted round it, with plenty of packing and felt, to prevent any marking of the stone. To the cradle were fixed two 1-inch steel eyebolts to receive the blocks for two six-folds of 6-inch ropes. These were secured and wound on to two strong winches fifty feet away, with four men at each winch. When the ropes were thoroughly tight the first excavation was made as the stone was raised on its west side in the following manner: Above each space to be excavated was placed a frame of wood, bearing on its long sides the letters A to H, and on its short sides the letters R M L, each letter being on a line one foot distant from the next. By this means the area to be excavated was divided into squares, each having the dimension of a square foot. A long rod divided into 6-inch spaces, numbered from 1 to 16, was also provided for indicating the depth from the surface of material. Earth chalk rubble was then taken out. The excavation was then begun by taking out the material 3 inches to 6 inches in thickness. A letter on the long sides of the frames, together with one on the short sides, and a number on the vertical rod, hence indicated the position of any object found in any part of the excavation. One Roman coin and one George III. penny were found quite near the surface. Numerous chippings of the sarsen and blue stone of which Stonehenge is built were discovered. The flints found were used for the softer sarsen and blue stones. Hand hammers and mauls were used for rough dressing. From the implements discovered the deduction has been made that the building belongs to the Palæolithic period.

All authorities so far agree that it is the work of a highly civilised people; the construction is a stone one, and the surface of the stone was finished much like granite. The design of the pillars was in my opinion evolved from the shapes of the flint instruments used by the workman, and to which his hand had grown accustomed. Each pillar has a bold entasis in its elevation and in its plan, and foreshadows the invention of the column. The British Association have formed a committee for investigating the ruder stone circles over this country. Excavations are at present being carried on by Mr. Garron at Aberlow in Derbyshire, and it is possible they may prove to be only rougher monuments, earlier or later, of the Stonehenge period.

It only remains for me, in conclusion, to say a few words upon the subject of orientation.

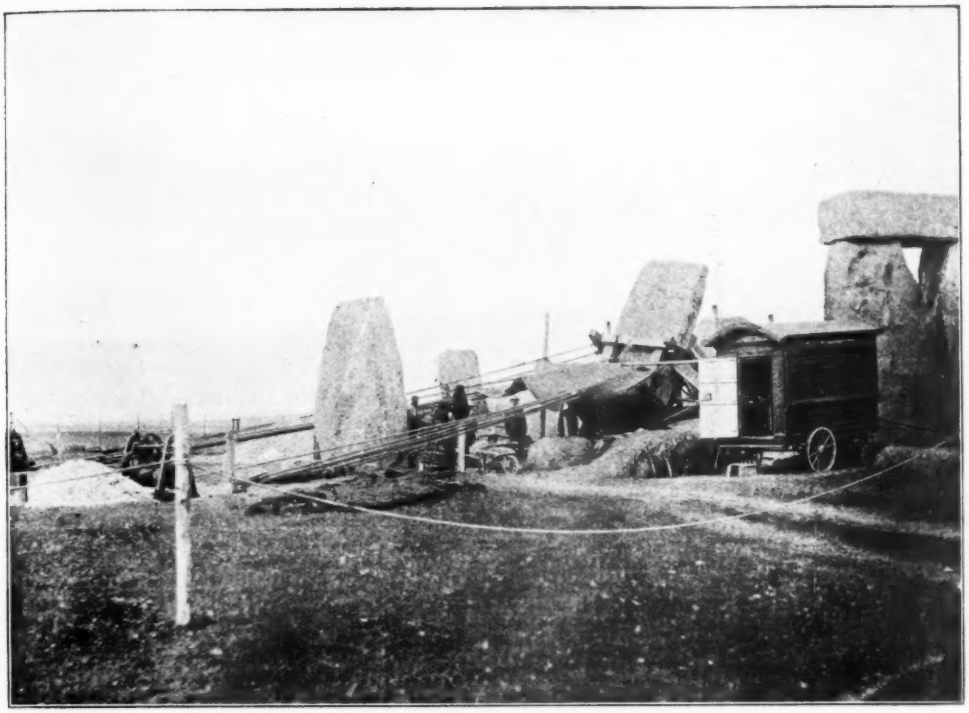


FIG. 2.—GENERAL VIEW.

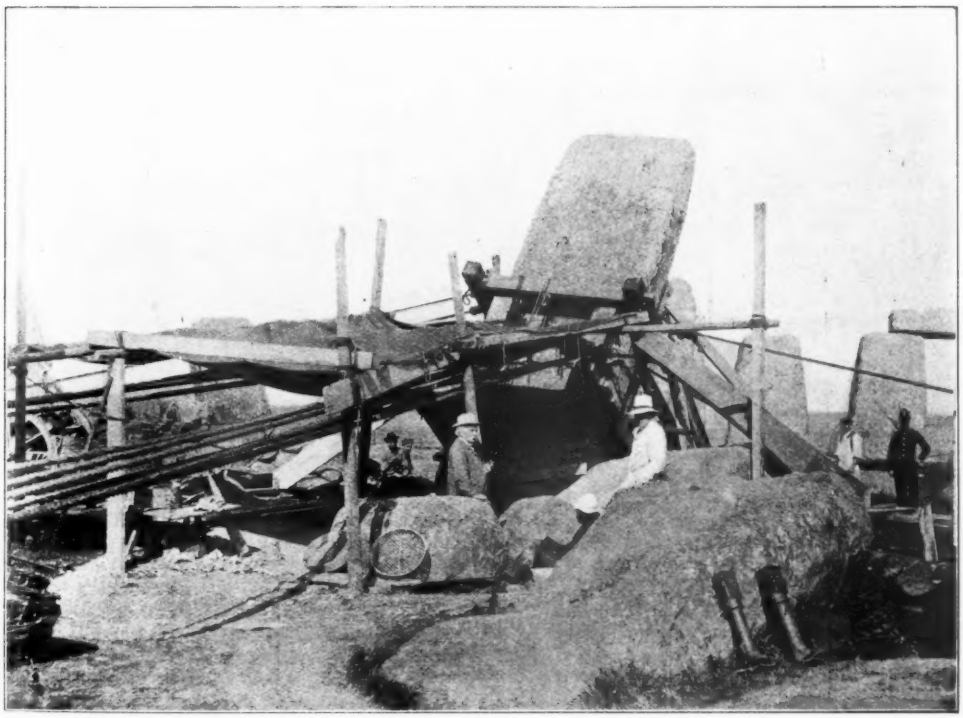


FIG 3.—STARTING FOR EXCAVATING WITH ROPES STRAINED.

The question is a puzzling one, as we find so many churches in England with the chancel slightly bending from the nave to the south. An explanation often given is that it is intended to represent the leaning head of our Lord; but I think from the slight observations already taken at Stonehenge that there is evidence to show, from the southerly direction in which the sun travels, and from the points of the compass there gradually tending towards the south, that these churches with the chancels slightly leaning out of the straight were erected on the site of very early primitive buildings.

*** Unfortunately for readers of the JOURNAL who were not present at the Meeting, the valuable part of Mr. Blow's discourse was comprised in his informal description of the excavations given during the exhibition of the lantern slides, which were very numerous, and, as may be gathered from those reproduced in these pages, of exceeding interest. Equally interesting were the series of plans hung round the Meeting-room, these including a plan of Stonehenge showing the present condition of the remains and the parts excavated under Dr. Gowland's guidance; plans and sections of the excavations, showing the nature of the soil and subsoil, and the actual spots where the flint implements, tools, and other relics were found. There were also exhibited a slab from the stone which has now been raised to its original vertical position, and specimens of the actual finds, such as stone chippings flint tools for dressing the softer stones, stone mauls, hammers for tooling the surface of the stones, specimens of rocks of which the stones consist, a copper-stained stone, bones found in the excavation, a deerhorn pick, fragments of pottery, coins, &c.

DISCUSSION OF MR. DETMAR BLOW'S PAPER.

Mr. JOHN SLATER, B.A.Lond., *Vice-President*, in the Chair.

In reply to Mr. Penrose Mr. Blow stated that the large and small hammers found were part of the same stone—a stone heavier and harder than sarsen.

SIR NORMAN LOCKYER, K.C.B., F.R.S., who was called on by the Chairman, said:—I need not say how extremely important the researches which Mr. Blow has put before us to-night are to anyone who studies Stonehenge—or any ancient monument which may be approximately of the age of Stonehenge—for the reason that archæologists have, I believe, quite come to the conclusion, from the evidence which has been obtained by the means which he has laid before us, that we are justified in assuming that the sarsen stones were erected in Neolithic times. That is to say, before the age of bronze; at all events before bronze had been used for any ordinary kind of work in that part of England. While this work has been going on—in fact, slightly before it was commenced—Mr. Penrose and myself have been occupying ourselves with Stonehenge from a slightly different point of view. We were anxious, if possible, to determine its age astronomically, because very much depends upon the true date of this unique structure. Stonehenge is the ancient monument in this country which lends itself to theodolite work better than any other. Avebury you know; and Stanton Drew is also known to a great many archæologists. There are also other very wonderful stone circles in Keswick and in other parts of England; but unfortunately it is very much more difficult to get certain astronomical data from these ancient monuments than it is in the case of Stonehenge, for the reason that Stonehenge itself lies high, and the horizon round it in all directions is pretty nearly the same height, so that the important question of the heights of the hills along the sight line—a matter which is very important from an astronomical point of view, although it has been absolutely neglected, so far as I can make out, by many who have made observations on these ancient monuments—is quite a simple one on Stonehenge. Hence it was much easier to determine a date there than by working at any of the other ancient remains to which I have referred. Now, in orientation generally, such orientation as has been dealt with by Mr. Penrose and myself in Egypt and in Greece, the question was a change in direction in the axis of a temple, or the laying down of the axis of a temple by means of observations of stars. Unfortunately for us as archæologists, not as astronomers, the movements of these stars, owing to certain causes, are very considerable; so that if a temple pointed to a star in one year, in two or three hundred years it would no longer point to the same star, but to another

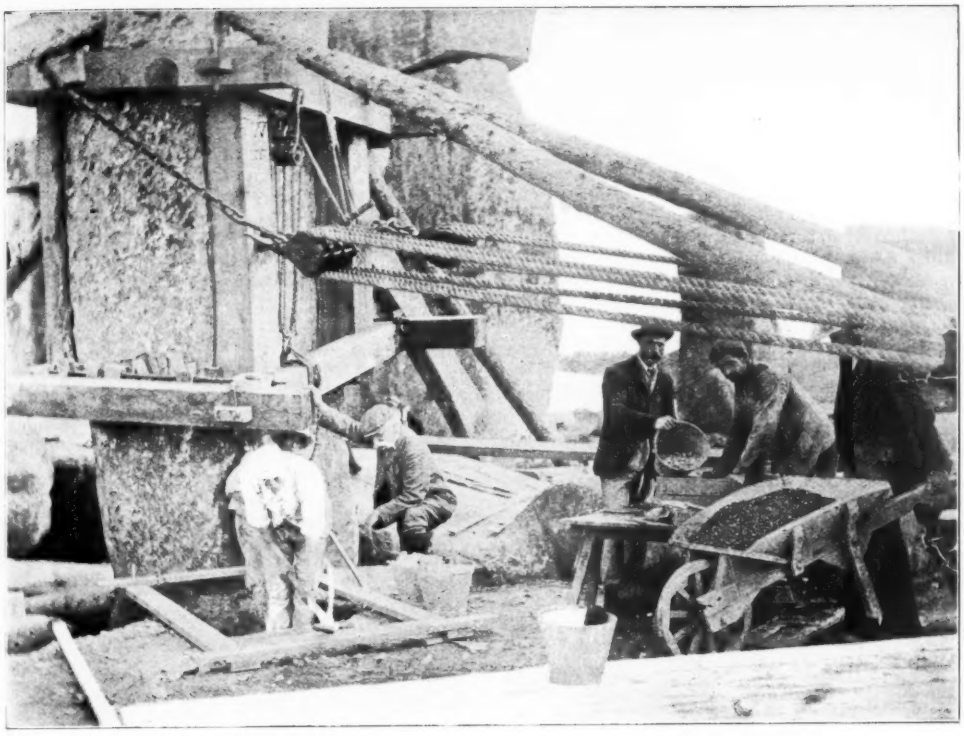


FIG. 4.—CUTTING THE SOIL IN SECTIONS 1 FOOT SQUARE, 6 INCHES DEEP.

FIG. 5.—SIFTING SOIL THROUGH FOUR DIFFERENT MESHES DOWN TO ¼-INCH SIZE.

one. That of course applies, as I have said, to the temples the direction of which has been determined in the first instance by observations of *stars*.

Now it has been a well-understood tradition, ever since we can remember, that the people from Salisbury and other surrounding places went to observe the sunrise on the longest day of the year at Stonehenge. We therefore were perfectly justified in assuming that it was a solar temple, and one used for observation in the height of midsummer. But at dawn in midsummer in these latitudes the sky is so bright that we are not in the habit of seeing stars even if we get up in the morning to look for them; so that some other principle had to be adopted, and that was to point the temple directly to the point of the horizon at which the sun rose on that particular day of the year, and no other. And here a very important point comes in, viz. the time of the year and of the day of the year most easy to fix by astronomical observation. As a matter of fact the solstice, the position of the sun on the longest day, is the point most easily fixed. All we have to do is to observe the sun climbing the sky at noon, and setting more and more to the north as the summer comes along, until at the very height of the summer we have the extreme north-easterly point of the horizon reached, and the sun stands still. We have the solstice, when all we have to do is to put a row of stakes up, and so fix the solstitial line. Of course, after that you will find, as mankind has found generally, that the sun comes back next year to that same solstitial place of rising or setting. So that when you have once got your alignment for the rise of the sun at midsummer, you can determine absolutely the length of the year, and the beginning of each year as it comes round. Now, if there were no change in the position of the sun, that, of course, would go on for ever and ever; but, fortunately for archæologists, there is a slight change in the position of the sun; the planes of the ecliptic and of the Equator undergo a slight change in the angle included between them; as far as we know that angle has been gradually reducing for many thousands of years, so that, in the case of Stonehenge, if we wish to determine the date, having no stars to help us, the only thing that we can hope to get any information whatever from is the very slow change of this angle, and that, therefore, is the special point which Mr. Penrose and myself set out to study at Stonehenge, because, for the reasons that I have already stated to you, we seemed in a position to do it more conveniently there than anywhere else in the country.

Well, we made our observations, and we came to the conclusion that the avenue which is associated with the sarsen stones, and which is practically a prolongation of the axis of the sarsen stones, was laid down with the circle of sarsen stones about the year 1680 B.C. We state that it is impossible to fix the date nearer than 200 years, for the reason that the change in the inclination of these planes to which I have referred varies so slowly.

There is another thing I should like to point out: our ancestors (I suppose they were our ancestors) who were engaged on these works have been very much misrepresented, and held entirely in the wrong, by several people who have not considered what they were really driving at. It was absolutely essential for the inhabitants of Britain as it was then—townless, almost uncivilised—that the people who herded their sheep, or tried to gather their crops and sow their seed, should know something about the proper time for performing their agricultural operations. We now go into a shop and for a penny buy an almanack which gives us everything we want to know about the year, the month, and the day, and that is the reason why so few of us care about astronomy; we can get all we want from astronomy for a penny or twopence. But these poor people, unless they found out the time of the year and the month and the day for themselves, had absolutely no means of knowing when their various agricultural operations should take place. So that we find all over the world such temples as Stonehenge erected in the very first blush of civilisation. On that a point comes in of very considerable interest with special reference to Stonehenge. If we study the civilisations in Egypt, we find that so far as we know the first people who used this principle of orientation for agricultural purposes was some tribe or other that came down the Nile about 7,000 years B.C. They used the star Canopus, and their determination was that of the autumnal equinox, which practically was the time when the Nile began to go down, and when their sowing might begin. After that we find another race who, instead of being interested in the sun, in worshipping the sun, and therefore interested in agriculture, at the time of the autumnal equinox, were interested in the year about the time of Easter. This race built the Pyramids about four thousand years B.C. You see there was an interval of about two or three thousand years between these races. And very shortly after that came another, who at Thebes started the solstitial worship; that is to say, the worship of the sun at midsummer, at the time when it was most easy to determine the length of the year, so as to enable them to go on with their agricultural operations in future years with greater certainty. Do not forget that first of all the farmers tried to plough and sow by the moon. You can see how hopeless agriculture must have been under such conditions. The month, indeed, was the only unit of time even of human life. We hear of people who lived "1,200 years," that means "1,200 months"—there is no question whatever about that now. When we look back in

the history of our own country—when we come back from Egypt to Britain, leaving alone Greece and Rome—we find that in various times in our country we have had a year, a farmer's year, beginning in the month of May; we have had another farmer's year beginning in the month of August; we have had another farmer's year beginning at the longest day, and it appears that the year beginning at the longest day was really the last year to be introduced. So that you see, although Mr. Penrose and myself have been able to show, I think beyond all doubt, that we have in Stonehenge a solstitial temple—that is to say, a temple to take observations of the length of the year by observing the rise of the sun on the longest day of the year; in other parts of England there were other temples observing the sun, not on the 21st of June, but early in May and early in August; and it is possible that at some future time Mr. Penrose and myself, when we come to consider the other stones at Stonehenge besides the sarsen ring, may show that even Stonehenge has something to tell us on that point also.

MR. F. C. PENROSE, F.R.S., D.Litt., D.C.L. [*F.*], said: Sir Norman Lockyer has given us a discourse which takes the wind entirely out of my sails; but there are a few observations I will make. One, I think, he did not observe—viz. that the avenue of Stonehenge, which has given us the clue more than any other part to arrive at its astronomical date, is exactly the counterpart of the lines of sphinxes which led to the entrances of many Egyptian temples. It is impossible to have studied these remains at Stonehenge without conceiving an extreme veneration for the monument, and I am rejoiced that so much attention is being paid to it, and that the repair of the temple has begun in a safe and legitimate manner by raising the leaning stone from a position of danger to one of its due majesty. We may perhaps hope that the external trilithon which fell down about a year ago may be put back into its position. I am sure, however, that the noble owner of the land at Stonehenge, whom Mr. Blow has served so extremely well, will take care that nothing too much is done. I attended, as doubtless others now present did, the evening at the Society of Antiquaries when Dr. Gowland described his observations during the works which have been lately done at Stonehenge. I gather, from what he said, that he had arrived at the conclusion, from the appearance of the tools found at Stonehenge, that the probable date is about 2,000 B.C. That is within our observation; that is to say, within a line of satisfactory *deviation*. Our 1700, with 200 plus or minus, comes, as near as one could possibly wish, to that estimate. An inspection of the tools placed before us on the table will show that many of them have been worn in the working. I should like to ask Mr. Blow one question. I understand, from Dr. Gowland's account of the works, that fragments both of the sarsens and of the blue stone, which is a kind of syenite, were found in the excavations. I should like to ask Mr. Blow if the chippings of the sarsen were of much greater abundance than the blue stone chippings. [MR. BLOW: Yes, they were.] Because it is possible, though by no means certain, that the blue stones may have been altered from their original position to suit the sarsens when they were put up. The quantity of the chips of the two materials may have a bearing upon that question. Syenite is very hard, and naturally there would be fewer chips of that, especially as the stones are smaller.

MR. EMANUEL GREEN, F.S.A.: Sir, I should like to say a word upon the general appearance of Stonehenge. We have not had altogether a good representation of it to-night, no doubt because a photograph showing the entire monument is a difficult thing to obtain. Very much has been said regarding the object of the structure, and Sir Norman Lockyer and Mr. Penrose have of late come forward with their theories, which possibly are right; but, without any offence, I think it is well not to allow authority to influence our opinions too much, and so perhaps prevent further investigations and further thought on the subject. It is a good rule of life for all of us to observe. There is no doubt that visitors often do sleep at Amesbury and go over in the early morning of the 21st of June, and no doubt also that on that morning the sun comes up exactly where you would expect him to come; and following that result we decide that the intention of the building was a question of sun-worship. This sun-worship, which we call paganism, has not ceased to-day; it was absorbed into our own system, it is still under our own system, and in some parts very much more than in others. Sir Norman Lockyer mentioned that possibly the idea of Stonehenge arose as a sort of almanack—very much like the hieroglyphics in the penny almanack of to-day. As to this, it may be noted that there are thirty stones on the outer circle, and if we imagine that on every day of the month some religious or other observance took place at a different stone daily, we get something like Robinson Crusoe's notches; by going through the thirty stones we get our month. There is a thirty-first stone also, not exactly in the circle, for they found in the course of the year that they had five days too many, and so this thirty-first stone would be visited five times a year, by which the calculation was made to tally. Within this circle of thirty stones there is a semicircle or horseshoe formed of five stones, and it can be suggested here that these mark the course of the summer sun. Taking the eastern side, the sun would be found to rise just through it about our April, and this event being watched for and seen, the summer and seed-time commenced. Then presently—say in a month—the sun will be found

FIG. 6.—SIDE ELEVATION OF THE LEANING STONE.

FIG. 7.—EAST VIEW OF THE LEANING STONE.

FIG. 8.—THE LEANING STONE UPRIGHT.

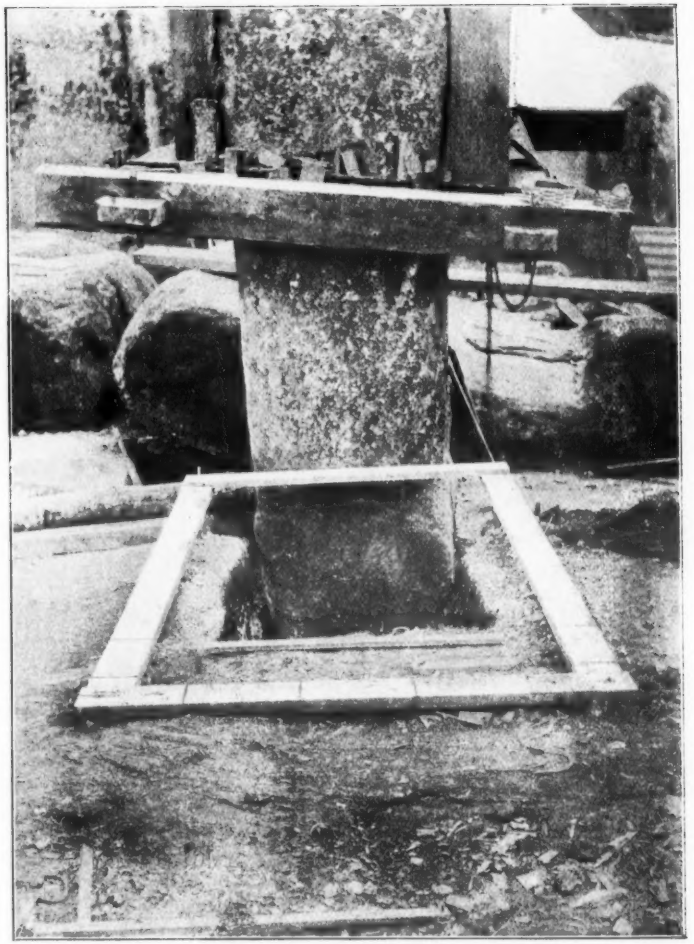


FIG. 9.—THE FRAME FOR REGISTERING THE FINDS.

to rise just through the next stone, a higher stone than the first, because the sun is now higher; the next, the centre, is the great, the highest of the whole, and through it at middle summer rises exactly the midsummer sun. Now the sun gradually lowers, and the stones westward are lowered. Watching through these now the setting sun, he is presently seen through the last, say about the end of our August, and the summer time, the time of growth and reproduction, is gone. The archæologist when he finds something the use of which he does not know must put to himself the question, Is the thing still existing elsewhere in its original use or in a similar use or state? And if he find that it is so he has something to go upon in forming a conclusion. It is rather a curious thing that in *The Earl and the Doctor*, a book published some years ago relating to a yacht voyage in the South Seas, the late Earl of Pembroke notices very plainly and very clearly (as he lived at Wilton, close to Stonehenge, of course he knew all about it) that he came across precisely the same thing going on in the Pacific Islands—viz. that when a man gets very old and very dirty and very poor he sets himself up for a priest, or what we should call a priest: he retires into solitude on high ground, and gets stones set up in a circle, with a stone avenue leading up to himself; and there he sits and receives cowrie-shells, or other equivalent for sovereigns. There is another thing connected with these structures which has never been noticed in regard to Stonehenge—viz. the spaces between the stones are, or have been, filled up with rubble. There are still in Scotland to-day buildings, whose use is not quite clear to us, with large stone uprights, large stones for the doorway, and large stones for the sills; and the spaces between are filled up with rubble. Then on the question of moving these stones. The Japanese plan shown on the screen is no doubt a real one; but in India can be seen to-day equally large stones moved in a manner which would recommend itself very much more to us, and to Salisbury Plain especially, where the ground is good for it—and there has been no alteration since. The stone is put upon rollers, on the plan one sees in moving an iron safe into a house sometimes: a roller is put in front on which the stone is rolled forward; then another man comes forward and puts another roller under, and so on. Some 200 men are thus harnessed, moving very slowly; what they do not do to-day they do to-morrow, and the stone eventually reaches its position. The question next arises: Whence came these stones? The answer must be left to geology rather than archæology; but the stones, we may fairly conclude, were there; there are sarsen stones there to-day—not so large, of course, but there they are, and they can sometimes be seen being broken up. There is no quarry in any known place from which they could have come, and they could not have been brought there. But we can understand that being there, or within a reasonable distance, they were placed in position in time. Then you have to compare Stonehenge with Avebury, which is fairly close by. At Stonehenge you have a worked stone. At Avebury the stones are much larger, perhaps because they are unworked, and so not reduced by being shaped. This is an important matter in relation to the Stonehenge work. It has always been a puzzle to everybody how these stones were worked, and it must still remain so for a little further investigation. The stones have been cut away on the top to leave a projecting part or point, and then the stone placed on the top is hollowed out in turn deep enough to take in that tenon. This in itself is a work which to us is very difficult and impossible practically to understand. The hammer, the stone chisel, &c., do not at all explain it. On the question of the date we must wait for a little further investigation. Mr. Story Maskelyne, a Wiltshire gentleman of no mean ability, has given considerable attention to this matter. To a pamphlet he printed, which I read some years ago, I am indebted for the more valuable suggestions noted. Mr. Maskelyne gave his reasons and figures freely; but he calculates its age at 2,900 years. Here we get a considerable difference of a thousand years, and yet the arguments given are equally clear and equally apparent. The Phœnicians coming to the district for tin, and coming from the eastern Mediterranean, where they were familiar with such stone work, may have taught the natives and also have given the architectural drawing. Clearly there had been some outside influence. In all these matters the more arguments we obtain, the more attention that consequently must be given to the subject, the more by degrees shall we approach the truth. As regards the orientation of our churches, mentioned by the lecturer, the chancel or eastern end was always built first, started on the morning of the saint's-day dedication, and sometimes a considerable time passed before the other part was commenced, and so their inclination would differ in accordance with the time of year at which the start was made.

MR. W. H. ST. JOHN HOPE, M.A.: I cannot claim, Sir, to have made these megalithic and rude monuments my study as I have monuments of a later date; but, like many others who have visited Stonehenge, I have been struck with astonishment at the stupendous character of the monument itself, and have wondered why it was made and how it was built, and I wanted an answer to a number of questions. I have tried to get an answer by reading a great deal of the vast quantity of matter that has been written about Stonehenge; but there are so many theories put forth by different writers that one leaves off in the same state of not knowing any-

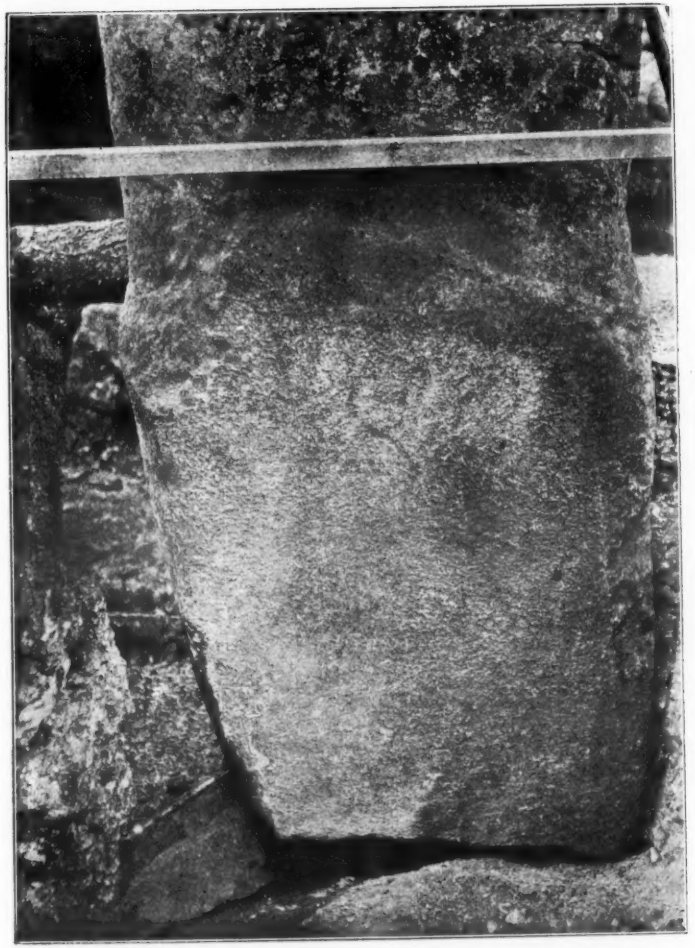


FIG. 10.—EXPOSED SURFACE OF BASE OF PILLAR, 8 FEET BELOW GROUND, SHOWING THE HIGH FINISH OF THE WORK.

FIG. 11.—THE BASE OF THE PILLAR WORKED 8 FEET 6 INCHES UNDER GROUND, SHOWING SURFACE OF STONE.

thing that one started with. The recent work at Stonehenge has shown the enormous value of investigation by means of the pick and spade. For two or three centuries at least men have wasted their time and brains by putting their theories on to paper, all to no purpose; and here in one little excavation within the space of a few days a very great deal has been set absolutely at rest. It is quite clear, from the material exhibited here to-night, that we can get some indication as to the date. I am sorry Mr. Gowland is not here to give us details about the discovery of these things, and the facts he has deduced from them; but as regards the date he argues that there can be no doubt whatever that these various tools, the small hammers and the large mauls, and the flint implements which were used for dressing the harder stones, belong to a period of transition from the Stone age to the Bronze age; and he does not dispute, so far as I can learn in conversation with him, the fact that this monument may even belong to the Early Bronze age; but he says that we can satisfactorily account for the absence of bronze tools by the simple reason that bronze tools would be utterly useless to work the stones of Stonehenge. Bronze would have no effect upon the hard sarsens; and naturally it would have no effect whatever upon the still harder blue stones. So that, although it is possible that further investigations may bring to light some bronze things that have been dropped, the tools which have been used in working the stones at Stonehenge were stone implements. The plan shows what a very small area has been already touched by way of this scientific investigation; and if that area has brought to light so much, it is likely that something more will be revealed when those investigations are extended further, as they probably will be. At present antiquaries are not agreed as to the date. Some of the French antiquaries, I believe, would take it as far back as Mr. Gowland is inclined to put it, and others will not allow a date of so remote a period; but it is satisfactory to find that, arguing from two totally different lines of research—that of the evidence of the tools which have been found and the astronomical data that Sir Norman Lockyer has so clearly explained to us—we do get what appears to be an average mean. The excavations have also set at rest another point. People have put forward theories about Stonehenge being a work of different dates. Some antiquaries argue that the blue stones were in position first, and the others added afterwards; and others have asserted the contrary. These excavations have definitely established the fact that the whole monument is of one time of erection. In every one of these excavations, I gather from Mr. Gowland, the blue-stone chippings and the sarsen chippings have been found mixed up together, even down to the lowest depth, which was 8 feet from the surface; and that proves the fact beyond any doubt. Then there was some interesting evidence brought to light as to how Stonehenge was built. The section exhibited giving the side views of the leaning stone show that behind it there is a block of live chalk rock, but in front of that Mr. Gowland told me he did not find any such chalk rock, but it is to be recovered again some distance away nearer the centre of the monument; and he argues from that (although he has not been able yet to get any more evidence) that these great stones were got into position first by sinking the hole into which the stone was eventually to go, and then cutting away one side to form an inclined plane; that the great stone was then got into its place at the head of the incline, by rollers or otherwise, and then slid down into the hole, which thus partly brought it up into a sloping position, and then, by means of wooden levers, it was raised up and packing put underneath it, and so by degrees it was lifted into a vertical position. It is quite easy to see that given unlimited labour those stones could have been set up in that way without any difficulty. But then there comes the question how the lintels were put up. Now, one of the theories I never could understand was the one that presupposed the raising of a large earthen incline up which the stone was rolled. There are certainly no signs upon the down of any material having been brought up for that purpose, and the people who have enunciated that theory have quite overlooked one fact—that in order to bear the weight of a great stone rolling up it that bank would have had to be of an enormous size, and must have had a considerable time to settle. But in conversation with Mr. Gowland on this point, he has suggested a way which is ingenious, and one can see that it is possible that it was so done. He argues that just in the same way that people begin to build a house in Japan by building the roof first and then the house underneath it, in the same way they put up these great trilithons at Stonehenge by lifting the great lintel, by means of packing, until they got it into its approximate position in the air, and that then, by lifting up the vertical stones in the manner I have described, and getting them into position underneath the lintel, the lintel could be dropped into its place on to the two uprights by the simple process of removing the packing; then the same packing could be used for another set of stones, and when the whole monument was erected the packing was taken away, and the whole site left clear. There is one point I should like to ask about, especially as Sir Norman Lockyer and Mr. Penrose are both present. In the paper which they recently read before the Royal Society on the question of the orientation of Stonehenge, they said that there can be no doubt whatever that Stonehenge was roofed in. I should very much like to know how Stonehenge could be roofed in. Looking at it purely from a layman's point of view, I cannot imagine any way by which Stonehenge could have

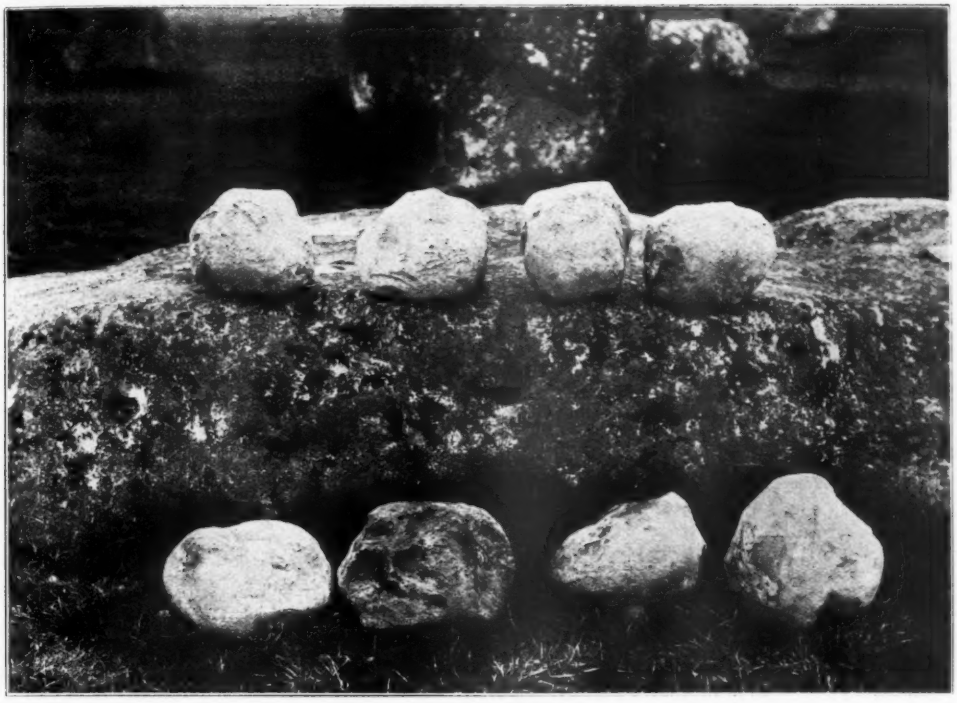


FIG. 12.—HAMMERS.

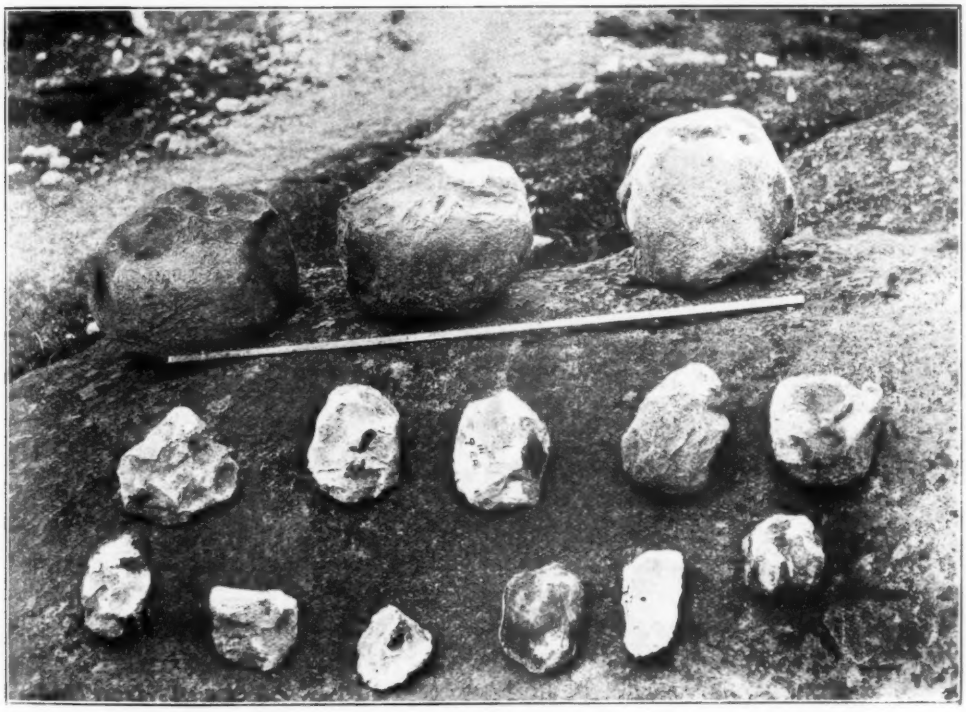


FIG. 13.—FLINTS FOR CUTTING SOFTER STONES.

a wooden roof on it which would have other than an outward thrust, which the stones are not calculated to bear; and there are certainly no marks on any of the existing stones of any woodwork, nor are there any signs of rubble filling-in between the uprights, or, in fact, any evidence whatever other than that the stones stood always by themselves quite clearly as they do now. I can imagine how Stonehenge could be roofed in one other way, and that is by a great roof of skins after the manner of a travelling circus. In that way the sag of the skin roof would be from the outside, and it would be less dangerous to the structure of Stonehenge, and have less tendency to throw the outer ring over than the other method would. But, so far as my own humble opinion goes, I fail to see how Stonehenge could have been roofed in, and I should very much like to know what Mr. Penrose's view, as an architect, is upon that question.

MR. PENROSE: With regard to the point about the roofing in, my impression is that it was stated "probably"—and I think it probably was—but that it was covered not by an apex roof, like a Greek temple, but with flat logs of wood, which could easily have been placed there, and covered with turf or in any other way, so long as the light was blocked out and a dark sanctuary was obtained. But with regard to the lifting of the stones it seems to me that there need be no very great question. Very much larger stones than the great lintels at Stonehenge, or even the standards themselves, have been lifted up in early days; there is in the so-called Treasury of Atreus at Mycenæ a stone twice the size or more, weighing at least 150 tons, lifted up to a great height; and at Baalbec there are stones twenty times the weight of these great stones lifted higher than the walls of this room. I think if they simply had levers, and with no limit of time or numbers to deal with, they could have done it by that method; and there are several other ways of lifting stones that might be suggested.

THE CHAIRMAN said he was quite sure the country was to be congratulated on having somebody to superintend the work and take the religious care over it that Mr. Gowland had shown in the excavations at Stonehenge. The scrupulous care with which he had mapped out the ground and preserved and allocated to its proper place every small coin and piece of flint implement discovered there showed that the work could not have been placed in better hands. Mr. Blow's Paper and description of the slides were extremely interesting, as were also the astronomical data and details in connection with the monument given by Sir Norman Lockyer.—The Chairman concluded by moving a hearty vote of thanks to Mr. Blow for his Paper, which was carried by acclamation.

MR. DETMAR BLOW, in responding, answered some of the questions raised during the discussion. With regard to Mr. Penrose's question about the stone, they were at the time digging round sarsen stone. From the small excavation so far carried out, one would gather that the whole place must have been strewn with chips; in fact, wherever they dug they found a quantity of chips of all kinds. Mr. Penrose had answered the question about raising the lintels. There were plenty of ways by which it might be done. If there were a mound by the structure it would be easy to get the pillars up and drop them into the ground. In the centre of the horseshoe at Stonehenge, round which the five trioliths had been erected, the ground must have been a sandy mound from which great baulks of timber could have been put on to the pillars, and the lintels slid up or rolled up in some way. The suggestion as to the roofing commended itself in every way; the fact that the west trilithon was so much higher than the two going towards the east suggested at once a fall for rain going from west to east. In conclusion, the speaker expressed his great regret that Mr. Gowland had been unable to be present that evening. He could not speak too highly of the splendid way in which he had conducted the excavation. He (the speaker) would impress upon young architects that it was their sacred duty, if they came across any kind of remains, to see that they were taken the greatest care of, and investigated. So often one heard that the builder had turned up some interesting relic, and had not troubled to find out anything about it, and the whole thing had been lost. In carefully investigating the sites of ecclesiastical or monastic buildings, or castles built for defensive purposes, it often happened that remains were discovered of buildings of a much earlier civilisation. On pulling down lately a Georgian house a Norman keep had been discovered, and on excavating further they found neolithic implements; so that on that site alone there were three distinct stages of building. One could not be too careful in making researches of this kind. He wished everyone present could have seen the care with which Mr. Gowland sifted the soil turned up in the Stonehenge excavation. If the same care had been bestowed on the work in other places not only in England but in Egypt a great many things that were now hazy would have been cleared up.

The Chairman having mentioned that Mr. Penrose had lately presented to the Institute a copy of the Paper which he and Sir Norman Lockyer had read to the Royal Society, Colonel Lenox Prendergast suggested that it would be valuable for this discussion to have the Paper printed in the Institute JOURNAL. The permission of the Royal Society having since been obtained, the Paper is printed on following pages.

AN ATTEMPT TO ASCERTAIN THE DATE OF THE ORIGINAL CONSTRUCTION OF STONEHENGE FROM ITS ORIENTATION.

By Sir Norman Lockyer, K.C.B., F.R.S., and F. C. Penrose, F.R.S.

[*Reprinted by permission from the* Proceedings of the Royal Society, Vol. LXIX. No. 452, 19 *Nov.* 1901.]

THIS investigation was undertaken in the spring of the present year, as a sequel to analogous work in Egypt and Greece, with a view to determine whether the orientation theory could throw any light upon the date of the foundation of Stonehenge, concerning which authorities vary in their estimates by some thousands of years. We beg to lay before the Royal Society the results derived from a careful study of its orientation for the purpose of arriving at the probable date of its foundation astronomically. This is not, indeed, the first attempt to obtain the date of Stonehenge by means of astronomical considerations. In Mr. Godfrey Higgins's work * he refers to a method of attack connected with precession. This furnished him with the date 4000 B.C.

More recently, Dr. W. M. Flinders Petrie,† whose accurate plan is a valuable contribution to the study of Stonehenge, was led by his measures of the orientation to a date very greatly in the opposite direction, but, owing to an error in his application of the change of obliquity, clearly a mistaken one.

As the whole of the argument which follows rests upon the assumption of Stonehenge having been a solar temple, a short discussion of the grounds of this view may not be out of place; and, again, as the approximate date which we have arrived at is an early one, a few words may be added indicating the presence in Britain at that time of a race of men capable of designing and executing such work.

As to the first point, Diodorus Siculus (ii. 47) has preserved a statement of Hecatæus in which Stonehenge alone can by any probability be referred to.

"We think that no one will consider it foreign to our subject to say a word respecting the Hyperboreans.

"Amongst the writers who have occupied themselves with the mythology of the ancients, Hecatæus and some others tell us that opposite the land of the Celts [ἐν τοῖς ἀντιπέραν τῆς κελτικῆς τόποις] there exists in the Ocean an island not smaller than Sicily, and which, situated under the constellation of The Bear, is inhabited by the Hyperboreans; so called because they live beyond the point from which the North wind blows. . . . If one may believe the same mythology, Latona was born in this island, and for that reason the inhabitants honour Apollo more than any other deity. A sacred enclosure [νῆσον] is dedicated to him in the island, as well as a magnificent circular temple adorned with many rich offerings. . . . The Hyperboreans are in general very friendly to the Greeks."

The Hecatæus above referred to was probably Hecatæus of Abdera, in Thrace, fourth century B.C.; a friend of Alexander the Great. This Hecatæus is said to have written a history of the Hyperboreans: that it was Hecatæus of Miletus, an historian of the sixth century B.C., is less likely.

As to the second point, although we cannot go so far back in evidence of the power and civilisation of the Britons, there is an argument of some value to be drawn from the fine character of the coinage issued by British kings early in the second century B.C., and from the statement of Julius Cæsar (*De Bello Gallico*, vi. 13) that in the schools of the Druids the subjects taught included the movements of the stars, the size of the earth, and the nature of things (Multa præterea de sideribus et eorum motu, de mundi magnitudine, de rerum natura, de deorum immortalium vi ac potestate disputant et juventuti tradunt).

Studies of such a character seem quite consistent with, and to demand, a long antecedent period of civilisation.

The chief evidence lies in the fact that an "avenue," as it is called, formed by two ancient earthen banks, extends for a considerable distance from the structure, in the general direction of the sunrise at the summer solstice, precisely in the same way as in Egypt a long avenue of sphinxes indicates the principal outlook of a temple.

* *The Celtic Druids*. 4to. London, 1827.

† *Stonehenge*, &c., 1880.

These earthen banks defining the avenue do not exist alone. As will be seen from the plan which accompanies this Paper, there is a general common line of direction for the avenue and the principal axis of the structure, and the general design of the building, together with the position and shape of the Naos, indicate a close connection of the whole temple structure with the direction of the avenue. There may have been other pylon and screen equivalents as in ancient temples, which have disappeared, the object being to confine the illumination to a small part of the Naos. There can be little doubt, also, that the temple was originally roofed in, and that the Sun's first ray, suddenly admitted into the darkness, formed a fundamental part of the cultus.

While the actual observation of sunrise was doubtless made within the building itself, we seem justified in taking the orientation of the axis to be the same as that of the avenue, and since in the present state of the S.W. trilithon the direction of the avenue can probably be determined with greater accuracy than that of the temple axis itself, the estimate of date in this Paper is based upon the orientation of the avenue. Further evidence will be given, however, to show that the direction of the axis of the temple, so far as it can now be determined, is sufficiently accordant with the direction of the avenue.

The orientation of this avenue may be examined upon the same principles that have been found successful in the case of Greek and Egyptian temples—that is, on the assumption that Stonehenge was a solar temple, and that the greatest function took place at sunrise on the longest day of the year. This not only had a religious motive; it had also the economic value of marking officially and distinctly that time of the year and the beginning of an annual period.

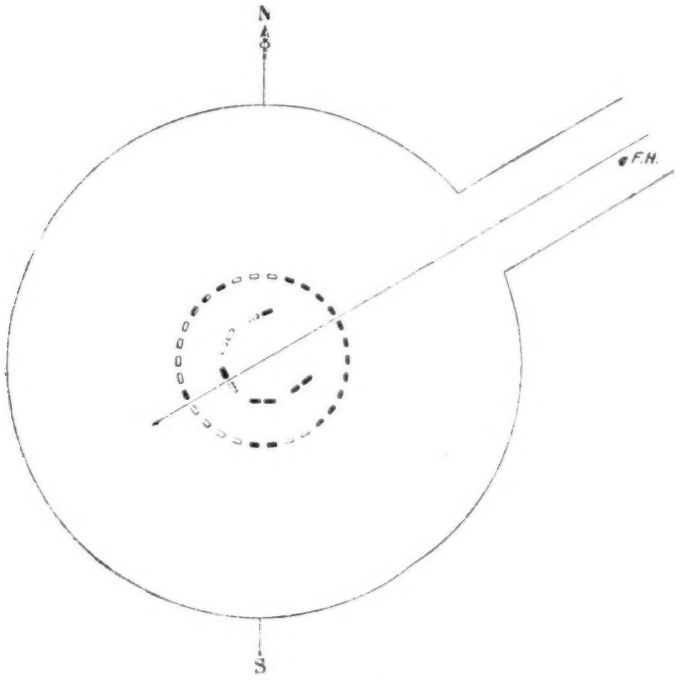
It is, indeed, probable that the structure may have had other capabilities, such as being connected with the equinoxes or the winter solstice; but it is with its uses at the summer solstice alone that this Paper deals.

There is this difference in treatment between the observations required for Stonehenge and those which are available for Greek or Egyptian solar temples—viz. that in the case of the latter the effect of the precession of the equinoxes upon the stars, which as warning clock stars were almost invariably connected with those temples, offers the best measure of the dates of foundation; but here, owing to the brightness of twilight at the summer solstice, such a star could not have been employed, so that we can rely only on the secular changes of the obliquity as affecting the azimuth of the point of sunrise. This requires the measurements to be taken with very great precision, towards which care has not been wanting in regard to those which we submit to the Society.

The main architecture of Stonehenge consisted of an external circle of about 100 feet in diameter, composed of thirty large upright stones, named sarsens, connected by continuous lintels, and an inner structure of ten still larger stones, arranged in the shape of a horseshoe, formed by five isolated trilithons. About one-half of these uprights have fallen and a still greater number of the lintels which they originally carried. There are also other lines of smaller upright stones, respecting which the only point requiring notice in this Paper is that none of them would have interrupted the line of the axis of the avenue. This circular temple was also surrounded by an earthen bank, also circular, of about 300 feet in diameter, interrupted towards the north-east by receiving into itself the banks forming the avenue before mentioned, which is about 50 feet across. Within this avenue, and, looking north-east from the centre of the temple, at about 250 feet distance and considerably to the right hand of the axis, stands an isolated stone, which from a mediæval legend has been named the Friar's Heel.

The axis passes very nearly centrally through an intercolumniation (so to call it) between two uprights of the external circle and between the uprights of the westernmost trilithon as it originally stood. Of this trilithon the southernmost upright with the lintel stone fell in the year 1620, but the companion survived as the leaning stone which formed a conspicuous and picturesque object for many years, but happily now restored to its original more dignified and safer condition of verticality. The inclination of this stone, however, having taken place in the direction of the axis of the avenue, and as the distance between it and its original companion is known both by the analogy of the two perfect trilithons and by the measure of the mortice holes on the lintel they formerly supported, we obtain by bisection the measure (viz. 11 inches) from its edge of a point in the continuation of the central axis of the avenue and temple, and which has now to be determined very accurately. The banks which

form the avenue have suffered much degradation. It appears from Sir Richard Colt Hoare's account that at the beginning of the last century they were distinguishable for a much greater distance than at present, but they are still discernible, especially on the northern side, for more than 1300 feet from the centre of the temple, and particularly the line of the bottom of the ditch from which the earth was taken to form the bank, and which runs parallel to it. Measurements taken from this line assisted materially those taken from the crown of the bank itself. With this help and by using the southern bank and ditch whenever it admitted of recognition, a fair estimate of the central line could be arrived at. To verify this, two pegs were placed at points 140 feet apart along the line near the commencement of the avenue, and four others at distances averaging 100 feet apart nearer the further recognisable extremity, and their directions were measured with the theodolite, independently by two observers, the reference point being Salisbury Spire, of which the exact bearing from the centre of the temple had



GENERAL PLAN OF STONEHENGE.

been kindly supplied by Colonel Johnston, R.E., the Director-General of the Ordnance Survey. The same was also measured locally by observations of the Sun and of Polaris, the mean of which differed by less than 20″ from the Ordnance value. The resulting observations gave for the axis of the avenue nearest the commencement an azimuth of 49° 38′ 48″, and for that of the more distant part 49° 32′ 54″. The mean of these two lines, drawn from the central interval of the great trilithon already referred to, passes between two of the sarsens of the exterior circle, which have an opening of about 4 feet, within a few inches of their middle point, the deviation being northwards. This may be considered to prove the close coincidence of the original axis of the temple with the direction of the avenue.

This value of the azimuth, the mean of which is 49° 35′ 51″, is confirmed by the information, also supplied from the Ordnance Survey, that from the centre of the temple the bearing of the principal bench mark on the ancient fortified hill, about 8 miles distant, a well-known British encampment named Silbury or Sidbury, is 49° 34′ 18″, and that the same line continued through Stonehenge to

the south-west strikes another ancient fortification, namely, Grovely Castle, about 6 miles distant and at practically the same azimuth, viz., 49° 35′ 51″. For the above reasons 49° 34′ 18″ has been adopted for the azimuth of the avenue.

The present solstitial sunrise was also watched for on five successive mornings, viz , June 21 to 25, and was successfully observed on the latter occasion. As soon as the Sun's limb was sufficiently above the horizon for its bisection to be well measured, it was found to be 8′ 40″ northwards of the peak of the Friar's Heel, which was used as the reference point, the altitude of the horizon being 35′ 48″. The azimuth of this peak from the point of observation had been previously ascertained to be 50° 39′ 5″, giving for that of the Sun when measured, 50° 30′ 25″, and by calculation that of the Sun with the limb 2′ above the horizon should be 50° 30′ 54″. This observation was therefore completely in accordance with the results which had been obtained otherwise.

The time which would elapse between geometrical sunrise, that is, with the upper limb tangential with the horizon, and that which is here supposed, would occupy about 17 seconds, and the difference of azimuth would be 3′ 15″.

The remaining point is to find out what value should be given to the Sun's declination when it appeared showing itself 2′ above the horizon, the azimuth being 49° 34′ 18″.

The data thus obtained for the derivation of the required epoch are these :—

(1) The elevation of the local horizon at the sunrise point seen by a man standing between the uprights of the great trilithon (a distance of about 8,000 feet) is about 35′ 30″, and 2′ additional for Sun's upper limb makes 37′ 30″.

(2) — Refraction + parallax, 27′ 20″.

(3) Sun's semi-diameter, allowance being made for greater eccentricity than at present, 15′ 45″.

(4) Sun's azimuth, 49° 34′ 18″, and N. latitude, 51° 10′ 42″.

From the above data the Sun's declination works out 23° 54′ 30″ N., and by Stockwell's tables of the obliquity, which are based upon modern determinations of the elements of the solar system,* the date becomes 1680 B.C.

It is to be understood that on account of the slight uncertainty as to the original line of observation and the very slow rate of change in the obliquity of the ecliptic, the date thus derived may possibly be in error by ± 200 years.

In this investigation the so-called Friar's Heel has been used only as a convenient point for reference and verification in measurement, and no theory has been formed as to its purpose. It is placed at some distance, as before mentioned, to the south of the axis of the avenue, so that at the date arrived at for the erection of the temple the Sun must have completely risen before it was vertically over the summit of the stone. It may be remarked, further, that more than 500 years must yet elapse before such a coincidence can take place at the beginning of sunrise.

We give in an appendix certain details of the observations.

We have to express our thanks to Sir Edmund Antrobus, Bart., for much kind assistance during our survey; and to A. Fowler and Howard Payn, Esqs., for skilful and zealous co-operation in the measurements and calculations. As already stated, Colonel Duncan A. Johnston, R.E., Director-General of the Ordnance Survey, has also been good enough to furnish us with much valuable information, for which our best thanks are due.

Appendix.

The instrument chiefly employed was a 6-inch transit theodolite by Cooke, with verniers reading to 20″ in altitude and azimuth. Most of the observations were made at two points very near the axis, which may be designated by *a*, *b*. Station *a* was at a distance of 61 feet to the south-west of the centre of the temple, and *b* 364 feet to the north-east. The distance from the centre of Stonehenge to Salisbury Spire being 41,981 feet, the calculated corrections for parallax at the points of observation with reference to Salisbury Spire are :—

Station *a* + 4′ 12″.
„ *b* −25 20.

* *Smithsonian Contributions to Knowledge*, vol. xviii. No. 232, table 9. Washington, 1873.

(1.) *Relative Azimuths.*—Theodolite at station *a*—

Salisbury Spire	0	0	0
N. side of opening in N.E. trilithon of the external ring	237	27	40
Tree in middle of clump on Sidbury Hill	237	40	20
Highest point of Friar's Heel	239	47	25
S. side of opening in N.E. trilithon	240	14	40
Middle „ „ „	238	51	10

(2.) *Absolute Azimuths.*—All the azimuths were referred to that of Salisbury Spire, the azimuth of which was determined by observations of the Sun and Polaris.

(*a.*) *Observation of Sun, June* 23, 1901, 3.30—3.40 P.M.

Mean of observed altitudes of Sun	41°	26′	35″
Refraction $-1'\ 4''$	0	0	58
Parallax $+\ 6$			
True altitude of Sun's centre	41	25	37

Latitude = 51° 10′ 42″. Sun's declination = 23° 26′ 43″. Using the formula

$$\cos^2\tfrac{1}{2}A = \frac{\sin\frac{1}{2}(\Delta+c-z)\,\sin\frac{1}{2}(\Delta+z-c)}{\sin c\,.\,\sin z}$$

where A = azimuth from south, Δ = polar distance,
c = co-latitude, and z = zenith distance,

we get

Azimuth of Sun	S. 75°	30′	30″	W.
Mean circle reading on Sun	84	38	35	
Azimuth of Salisbury Spire	S. 9	8	5	E.

(*b.*) *Observations of Polaris.*—June 23, 1901. Time of greatest easterly elongation, calculated by formula $\cos h = \tan\phi \cot\delta$ is G.M.T. 1.34 A.M.

Azimuth at greatest easterly elongation, calculated by the formula

$$\sin A = \cos\delta \sec\phi,$$

is 181° 57′ 0″ from south.

Observed maximum reading of circle	256°	33′	0″	
True azimuth of star	181	57	0	
Meridian (S.) reading of circle	74	36	0	
Circle reading on Salisbury Spire	65	28	0	
Azimuth of Salisbury Spire	S. 9	8	0	E.

The mean of the two determinations gives for the azimuth of Salisbury Spire S. 9° 8′ 2″ E. This result agrees well with the value of the azimuth communicated by the Ordnance Survey Office, namely, 9° 4′ 8″ from the centre of the circle, which, being corrected by +4′ 12″ for the position of station *a*, is increased to 9° 8′ 20″.

Hence from the point of observation *a* 9° 8′ 20″ has been adopted as the azimuth of Salisbury Spire.

We thus get the following absolute values of the principal azimuths from the point *a*:

Highest point of Friar's Heel	239°	47′	25″	
	− 9	8	20	
	230	39	5	
	or N. 50	39	5	E.
Middle of opening in N.E. trilithon	238	51	10	
	− 9	8	20	
	229	42	50	
	or N. 49	42	50	E.

The difference of $8\frac{1}{2}'$ between this and the assumed axis 49° 34′ 18″ is so slight that, considering the indirect method which has necessarily been employed in determining the axis of the temple from the position of the leaning stone, and the want of verticality, parallelism, and straightness of the inner surfaces of the opening in the N.E. trilithon, we are justified in adopting the azimuth of the avenue as that of the temple.

Next, with regard to the determination of the azimuth of the avenue as indicated by the line of pegs to which reference is made in the body of the Paper. The small angle between the nearest pegs A and B (which are supposed to be parallel to the axis of the avenue), observed from station *a*, was measured, and the corresponding calculated correction was applied to the ascertained true bearing of the more distant peg B.

Thus

True bearing of peg B	=	238°	35′	0″
Calculated correction to peg A	=	0	12	8
True bearing of line AB		238	47	8
Bearing of Salisbury Spire		189	8	20
True bearing of a line parallel to the axis of near part of avenue	N.	49	38	48 E.

The mean of the three independent determinations by another observer was 49° 39′ 6″.

The calculated bearing of the more distant part of the axis of the avenue determined in the same manner by observations from station *b* is 49° 32′ 54″. The mean of the two, namely, 49° 35′ 51″, justifies the adoption of the value 49° 34′ 18″ as given by the Ordnance Survey for the straight line from Stonehenge to Sidbury Hill.

(3.) *Observation of Sunrise.*—On the morning of June 25, 1901, sunrise was observed from station *a*, and a setting made as nearly as possible on the middle of the visible segment as soon as could be done after the Sun appeared.

The telescope was then set on the highest point of the Friar's Heel, and the latter was found to be 8′ 40″ south of the Sun.

Sun's declination at time of observation		23°	25′	5″
Elevation of horizon at point of sunrise		0	35	48
Assuming 2′ vertical of Sun to have been visible at observation, we have apparent altitude of Sun's upper limb .		0	37	48
Refraction . . . . . −27′ 27″	} −0	27	18	
Parallax . . . . . + 0 9				
True altitude of upper limb		0	10	30
Sun's semi-diameter		0	15	46
True altitude of Sun's centre	−0	5	16	
From this it results that the azimuth of the Sun at the time of observation	=N.	50°	30′	54″ E.
And since azimuth of Friar's Heel	=	50	39	5
2′ of sunrise should be N. of Friar's Heel		0	8	11
Observed difference of azimuth	=	0	8	40
Observed—calculated	=	0	0	29

The observation thus agrees with calculation, if we suppose about 2′ of the Sun's limb to have been above the horizon when it was made, and therefore substantially confirms the azimuth above given of the Friar's Heel and generally the data adopted.

9, Conduit Street, London, W., 25*th Jan.* 1902.

CHRONICLE.

THE PRIZES AND STUDENTSHIPS, 1902.

The Council's Deed of Award.

To the General Meeting, 20th January 1902.

Gentlemen,—Pursuant to the terms of By-law 66, that the Council shall, by a Deed or Writing under the Common Seal, award the Prizes and Studentships of the year, and announce such awards at the next General Meeting after the adjudication, the Council have the honour to state that they have examined the several works submitted for the two Silver Medals of the Royal Institute, the Soane Medallion, the Owen Jones and Pugin Studentships, the Godwin Bursary, the Tite Prize, and the Grissell Gold Medal.

The Royal Institute Silver Medals.

(i.) *The Essay Medal and Twenty-five Guineas.*

Four Essays on the Employment of the Order in Renaissance and Modern Architecture were received for the Silver Medal under the following mottoes:—

1. "Almawimi."
2. "Serlio."
3. Simplex.
4. Tempus Fugit.

The Council regret that they are unable to award the Medal, but they have voted the sum of Ten Guineas to the author of the Essay bearing the motto "Serlio" [*John Jeffrey Waddell, Drumoyne, Uddingston, N.B.*].

(ii.) *The Measured Drawings Medal and* £10. 10*s.*

Twelve sets of Drawings were sent in, of the several buildings indicated, and under motto, as follows:—

1. Ace: (Eltham Palace, Eltham, Kent).
2. Aidan: (Lindisfarne Priory).
3. Cavendo Tutus: (Bolsover Castle).
4. Inca: (Houghton Hall, Norfolk).
5. La Oriole: (Oriel College, Oxford).
6. Peakite: (Bolsover Castle: Riding School).
7. Scheherazade: (King Henry's Gate, St. Bartholomew's Hospital).
8. Semper Fidelis: (Guildhall, Exeter).
9. Strand: (St. Mary-le-Strand Church).
10. "Wren": (Emmanuel College Chapel, Cambridge).
11. H in circle: (Aston Hall, Warwickshire).
12. Device of Two Lozenges (St. George's Church Bloomsbury).

The Council have awarded the Silver Medal and Ten Guineas to the delineator of Bolsover Castle, submitted under the motto of "Cavendo Tutus" [*Frederick William Charles Gregory*, 13 *Gregory Avenue, Lenton Boulevard, Nottingham*], and prizes of Five Guineas each to the delineators of Lindisfarne Priory, Houghton Hall, and Aston Hall, Warwickshire, submitted under the respective mottoes of "Aidan" [*Reginald Wynn Owen* [*A.*], 24 *Oxford Road, Waterloo, Liverpool*], "Inca" [*Stanley Towse, Hillside, Ravensbourne Park, Catford*], and "H in circle" [*Edwin Francis Reynolds*, 61 *Ladbroke Road, Notting Hill Gate, W.*].

The Travelling Studentships.

(i.) *The Soane Medallion and* £100.

Sixteen Designs for a Swimming Bath for Men were submitted, under the following mottoes:—

1. Amphibious.
2. Balneæ.
3. Faust.
4. Hero.
5. Io.
6. Iona.
7. Naiad.
8. Natator.
9. Nero.
10. Phœnix.
11. Roma.
12. Silhouette.
13. Tepidarium.
14. Ursa Major.
15. Wyvenhoe.
16. Zeno.

The Council have awarded the Medallion and (subject to conditions) the sum of One Hundred Pounds to the author of the design bearing the motto of "Iona" [*James B. Fulton, East Chapelton, Bearsden, Glasgow*], Medals of Merit to the authors of the designs bearing the mottoes respectively of "Balneæ" [*Lionel Gordon Detmar* [*A.*], *Hazeldean, Sutton, Surrey*] and "Tepidarium" [*Thomas Anderson Moodie* [*A.*], 10 *Artesian Road, W.*], and a Certificate of Honourable Mention to the author of the design bearing the motto "Io" [*E. Vincent Harris* [*A.*], 44 *Mornington Road, Regent's Park, N.W.*].

(ii.) *The Owen Jones Studentship and* £100

Seven applications were received for the Owen Jones Studentship from the following gentlemen:—

1. Edward H. Bennett.
2. Cecil Scott Burgess.
3. V. J. Cummings.
4. L. Rome Guthrie.
5. James McLachlan.
6. Percy E. Nobbs.
7. Ramsay Traquair.

The Council have awarded the Certificate and (subject to the conditions, among others, that the said candidate devote a tour of not less than six months' duration to the improvement and cultivation of his knowledge of the application of colour as a means of architectural expression, and furnish the Council with an original design in coloured decoration of a prescribed subject) the sum of One Hundred Pounds to *Mr. Edward H. Bennett*, 18 *Rue Bonaparte, Paris*; a Prize of £10. 10*s.* to *Mr. Percy Erskine Nobbs, M.A.Edin.* [*A.*], 8

Trafalgar Square, Chelsea, S.W.; and a Prize of £5. 5s. to *Mr. James McLachlan*, 125 *Warrender Park Road, Edinburgh.*

(iii.) *The Pugin Studentship and* £40.

Twelve applications were received for the Pugin Studentship from the following gentlemen:—

1. George A. Bachmann.
2. Heaton Comyn.
3. P. Ion Elton.
4. J. W. Farmer.
5. J. Harold Gibbons.
6. W. S. A. Gordon.
7. Stanley H. Hamp.
8. A. Muir.
9. J. B. Pye.
10. J. Myrtle Smith.
11. C. Wontner Smith.
12. P. J. Westwood.

The Council have awarded the Medal and (subject to the condition, among others, that the said candidate devote a tour of not less than eight weeks' duration in some part of the United Kingdom to the study of Mediæval Architecture) a sum of Forty Pounds to *Mr. Cyril Wontner Smith* [*A.*], *Grasmere, Hendon Lane, Finchley, N.*; Prizes of Five Guineas each to *Mr. Andrew Muir*, 39 *Cromwell Avenue, Hammersmith, W.*, and *Mr. J. Myrtle Smith*, 180 *New Bond Street, W.*; and a Certificate of Honourable Mention to *Mr. John Harold Gibbons, Guardian Assurance Buildings*, 25 *Cross Street, Manchester.*

(iv.) *The Godwin Medal and* £40.

Two applications were received for the Godwin Bursary from the following gentlemen:—

1. Henry L. Merille de Colleville.
2. Charles A. Daubney.

The Council have awarded the Medal and (subject to the condition, among others, that the said candidate devote a tour of not less than five weeks' duration in some part of Europe other than Great Britain and Ireland, or America, for the purpose of studying and reporting on works of modern architecture) the sum of £40 to *Mr. Charles Archibald Daubney* [*A.*], 1 *Wellington Road, Peckham, S.E.*

(v.) *The Tite Certificate and* £30.

Twenty-four Designs for a Royal Memorial Chapel in the Italian Style were submitted under the following mottoes:—

1. "Archivolt."
2. Avanti Savoia.
3. Bramante da Urbino.
4. "Duomo."
5. Gibbs.
6. Issius.
7. "In Memoriam."
8. "John-o'-Gaunt."
9. Lion Heart.
10. Marble.
11. Moab.
12. Nero.
13. Nimrod.
14. "Pax."
15. Petronius.
16. Rex on grey strainers.
17. Rex on brown strainers.
18. R.I.P. on 3 strainers.
19. R.I.P. on 5 strainers.
20. Tendimus.
21. Device of a Shamrock.
22. Device of a Circle.
23. Device of a Blue Cross.
24. Device of 3 Red Seals.

The Council have awarded the Certificate, and (subject to the condition, among others, that the said competitor, after an absence of not less than four weeks, shall submit satisfactory evidence of his studies in Italy) a sum of Thirty Pounds to the author of the design bearing the motto "Lion Heart" [*Charles Gascoyne, Ashleigh, Sherwood, Nottingham*], a Medal of Merit to the author of the design bearing the motto "In Memoriam" [*Andrew Hutton*, 16 *Annfield Street, Dundee*], and a Certificate of Honourable Mention to the authors of the designs bearing the mottoes "Marble" [*W. Curtis Green*, 63 *Bedford Gardens, Campden Hill, W.*], "Rex on grey strainers" [*Arthur R. Gough* [*A.*], 24 *Bridge Street, Bristol*], and "Shamrock" [*Cyril Edward Power, Rugby Chambers, Great James Street, Bedford Row, W.C.*] respectively.

Prize for Design and Construction.

The Grissell Medal and £10. 10*s.*

Six designs for a Roof, in Iron, Concrete, and Glass, of a Picture Gallery were submitted under the following mottoes:—

1. Cædmon.
2. Groined Barrel.
3. Hertford.
4. Rover.
5. Toby.
6. Red Trefoil.

The Council have awarded the Medal and Ten Guineas to the author of the design bearing the motto "Toby" [*Lionel Upperton Grace*, 33 *Munster Square, Regent's Park, N.W.*].

The Ashpitel Prize 1901.

The Council have, on the recommendation of the Board of Examiners (Architecture), awarded the Ashpitel Prize (which is a Prize of books value £10, awarded to the candidate who has most highly distinguished himself among the candidates in the Final Examinations of the year) to Mr. Charles Thomas Adshead, of Liverpool. Mr. Adshead was registered *Probationer* in 1894, *Student* in 1897, and passed the Final Examination in November 1901.

The Council have further awarded a Prize of books to the value of £10 to Mr. Frederick Dare Clapham in recognition of the merit displayed by him in his work at the Special Examination, June 1901.

The Travelling Students' Work.

Owen Jones Studentship 1900.—The Council have approved the drawings and design executed by Mr. George Andrew Paterson, who was awarded the Owen Jones Studentship for 1900, and who travelled in France, Italy, and Spain.

Godwin Bursary 1900.—The Council have approved the Report of Mr. Sidney Kyffin Greenslade [*A.*], who was awarded the Godwin Bursary in 1900, and who visited the United States of America to study the Planning and Construction of Public Libraries.

The Council have awarded Mr. Greenslade an extra grant of £20 out of the Godwin Fund to enable him to continue his studies.

Pugin Studentship 1901.—The Council have approved the work of Mr. Henry William Cotman, who was elected Pugin Student for 1901, and who travelled in Wiltshire, Somersetshire, Dorsetshire, Gloucestershire, Warwickshire, and Oxfordshire.

In witness thereof the Common Seal has been hereunto affixed this Twentieth day of January 1902, at a Meeting of the Council.

(*Signed*) JOHN SLATER, *Vice-President*; ASTON WEBB, E. W. MOUNTFORD, *Members of Council*; ALEXANDER GRAHAM, *Hon. Secretary*; W. J. LOCKE, *Secretary*.

REVIEWS.

RAVENNA'S CLAIM.

Le origini della Architettura Lombarda, e delle sue principali derivazioni nei paesi d'oltr'Alpe. Vol. I. G. T. Rivoira. 4o. *Roma* 1901. [*Ermanno Loescher & Co.*]

The Dark Ages, it would seem, are some day soon to be as bright as Piccadilly. Writer after writer makes attacks upon their gloom, and poor Truth in her well's depth has so often had her discreet privacy violated by the obtrusive flash of search-lights that one almost feels a touch of compassion for her state—a touch, if one may say it, of regret at the present disregard of her ancient modesty. But this is foolishness—an acknowledgment of frailty, a twinge of the heartache that goes with all progress. Of course, nothing but praise is really due to the fact-finders, and among them to Signor Rivoira. His new book on the origins of Lombard architecture is a valuable piece of evidence-hunting, and he has brought together (whether his theories prove convincing or no) an excellent range of well-chosen, and in some cases rather unknown, examples. His book, to quote his own words, is the working out of an idea, a theory which flashed upon him in one of his architectural travels. Signor Rivoira had noticed, as others notice, that the writers on architecture have been slow in coming to any lucid conclusions, or indeed in producing any clear historical evidences, on the period of Italian art which extends from the middle of the sixth century to the opening of the eleventh—in other words, from the descent of the Longobards to the developed appearance of the style which is known as the Lombard or Comacine. He is no doubt right in attributing the architectural mysteries of this obscure age in large measure to the frailties of the writers themselves—their differences, their errors, and above all their prejudices. Some of them, having gone too much to books and too little to buildings, have thus been unduly ready to accept and to reaffirm statements and theories which had no basis in fact; others, whose ideas have been rather too wide than too narrow, have, in Signor Rivoira's opinion, made the mistake of searching in far foreign lands for the "origins, influences, examples, and artificers" that were really to be sought for on Italian soil. Even Cattaneo's important work falls in some degree under the condemnation, and the author feels that its value is compromised, not only by haste and inefficient preparation, but also by a preconceived idea of Byzantine origins and by an undue fidelity to Cordero's publication on Italian architecture under the Longobard rule. His own aim has been to avoid the errors of his predecessors by the plain but difficult expedients of keeping an open mind and taking infinite pains. "New evidences and no prejudices," these are his watchwords; and his line of argument is the following.

The architecture which preceded the Lombard style had, in a sense, its origin in Lombardy, and was the work of those combinations of operatives known as the Comacine or Lombard Guilds. Its rise is to be ascribed chronologically to the time of the Longobard King Autaris and his successors, among them the celebrated Theodolinda; in fact, to the close of the sixth and the opening of the seventh centuries—a period which coincides with the initial stages of decay in that great architectural activity at Ravenna which had sprung into being at the beginning of the fifth century, the date of the transference to Ravenna of the seat of Western Empire.

It was, says Signor Rivoira, from the products of the art of Ravenna that the guilds of Lombardy derived their inspiration. They borrowed from it in the first instance certain general principles of architectural decoration, and eventually appropriated "certain organic elements alike of primary and secondary importance." Milan and Ravenna seem to have hung in opposite scales; the rise of one was the proportionate collapse of the other.

From the time of Maximian (286), Milan had enjoyed a career of increasing prosperity in art (having indeed been a city of riches and strength ever since the days of Augustus); but with Honorius and the establishment of the Court at Ravenna there came dark days for the dispossessed town, which lost, not its prestige only, but as it would seem its very artificers, for no doubt they, like other necessaries of Court life, were transported from capital to capital. In fact, the artistic fortunes of Milan went from bad to worse all through the fifth and sixth centuries, till, at the close of the latter, we find evidences of a happy change. It was then that the Comacine masters, profiting by the special privileges which they held under the Longobard rule, and by the many opportunities of building enterprise which lay before them, began to raise their art from the miserable condition into which it had been submerged. The result of this revival of energy, and

consequent revival of skill, was, according to Signor Rivoira, that the "Lombard" artists (if we may give them this name) found themselves invited to the exercise of their craft even in such far-away spots as Dalmatia and the Transalpine countries; and further, that to meet their new needs they drew new inspiration from the buildings of Rome and of Ravenna, deriving from them the ingredients, so to speak, and elements which, after a course of development, sufficed to transform the old architecture of Classic Italy into a new style suited to new needs. All this was not done in a day. The seventh century saw the first developments of the movement dimly initiated at the close of the sixth. The eighth, the century of Charlemagne, witnessed its increase; the ninth, a still further spread, under the religious enthusiasm of two Milanese archbishops; and with the tenth century came still warmer religious fervour, fanned by the prospect and fear of the world's ending with the millennium, the climax being that at the close of the first quarter of the eleventh century the "Lombard organism was already formed, and in the middle of the century appeared the first type of the Lombardic vaulted Basilica."

In his study of the transfer of ideas from the Adriatic shore to the Lombard plain, Signor Rivoira takes, it seems to me, a somewhat unusual view of the intellectual side of mediæval building craft. A new architectural style, as he truly observes, is not a new creation of human genius, but an evolution from some more ancient manner. Art never dies; and if sometimes we see her lying for dead, none the less is her body ready to revive at the breath of some new life-giving spirit. Such occasions of new birth, which come as it were to signalise the arrival of a new civilisation, are not the work of a moment, nor are they immediate in their effect. Their progress, on the contrary, is slow and periodic, and it is found that times of peace and prosperity, which feed the gathering strength of the new art, alternate with intervals of apparent quiescence, which in their turn are in reality times not of stagnation but of preparatory repose. In such a statement as this we can agree with him entirely, but it is when he comes to put forward his view as to the *conscious* preparation and *conscious* collection of material that we realise how new is his line of argument.

"Thus it was"—translated somewhat freely—"that the architectural movement of the eleventh century, which took place first in Italy and subsequently beyond the Alps, was preceded by a long period in which the monuments of Rome and Ravenna were subjected to study; thus it was that there took place a series of laborious and repeated enterprises destined—by way of compromise between the past arts of Rome, Ravenna, and the pre-Lombard art of the Comacines—to transmute the architecture of classic times into what we know as the Lombard style."

It will be for the readers of Signor Rivoira's work to decide for themselves how far he is justified in attributing to the builders of the Middle Ages a system of study for purposes of architectural assimilation which, though it would have a dim reflection in the methods of the Renaissance, could only find its real parallel in the eclecticism of our own modern day. I confess that for my own part I find it difficult to realise the possibility or probability of such a spirit in such an age. But should it prove that Signor Rivoira is mistaken on this head, the mistake would be no bar to the value of his book. There are other ways of gleaning from the architecture of a bygone age and of a different place than the way of direct study and intentional imitation. The author's facts as to the lines of derivation may be perfectly sound though his theory of the method of transmission may be erroneous; and his main proposition, which is the supremacy of the Ravennate school in the genesis of Lombard art, is not merely attractive but in a large measure convincing.

It is of course impossible here to follow the writer through the particular steps of his argument or to mention a tithe of the buildings from which he draws his evidence: it must suffice to indicate as examples of his methods the proof on p. 11 that the *pulvino*, which is one of the characteristics common to Byzantium and Ravenna, is really the property of Ravenna; the similar vindications (p. 71) of the builders of San Vitale, who are shown, without undue denial of Byzantine influence, to be Italians, not Orientals; and the interesting arguments which trace to Ravennate origin the blind arcades which are recognised as a distinguishing feature of Lombard architecture.

It is not very long ago that we were bidden to look on sunny little Como * as the birthplace of Gothic art: we are now, it seems, to honour Ravenna in like manner, for I make no doubt that Signor Rivoira's second volume, when it appears, will, as it has traced "Lombard" art to Ravenna, derive the work of northern Europe from the labours of Lombardy. In spite of this apparent divergence of theory as to locality, there is in truth much common ground between the supporters of the Comacine theory and this new idea of Ravennate origin. Both schools are in favour of a unity of source in eleventh-century architecture, both recognise the guild of Lombardy as a powerful operative agency, and both press Italian claims as against Byzantine. The issue of Signor Rivoira's argument is as yet undeter-

* I allude to Merzario's book, *I Maestri Comacini*, practically unknown to English readers except through the medium of Leader Scott's *Cathedral Builders*.

mined, but if, as seems possible, he is intending to mark the birthplace not merely of Lombard but of Gothic art in general, there will here be found another point of unanimity.

To the sentimental there will be no blow in this displacement of the affections. Ravenna—the remote and rather inhospitable resting-place of Dante, the home of Honorius and Theodoric—is at least as appropriate to meditation on the growth of a great art as is the tourist-haunted birthplace of Volta. Not that Como need be discouraged either by her present rather vulgar frequentation or by this attempt on the part of the friends of Ravenna to share her claims on the parentage of Gothic art: she will always remain in the minds of Vitruvians the *amœna e delectavole citate* from which was issued by Gotardo da Ponte the proud volume of Cesare Ciserano.

PAUL WATERHOUSE.

PORTLAND CEMENT.

The Cement Users' and Buyers' Guide. By Calcare. [*E. & F. N. Spon, Ltd.*, 125 *Strand.*]

In this very little book is given an outline of the history of Portland cement, an account of its manufacture, with tests for soundness, purity, and strength, together with methods of buying, storing, and mixing it. The feature of the book, and possibly the *raison d'être*, is a list of certain cement makers conveniently near the important towns in the British Isles, with the exception of Scotland, where apparently little or no cement is made.

On the subject of quality the author describes those tests for soundness which are more notable for simplicity than for their expeditious results. The Arnold briquette mould system of testing, in which, however, a small plant is used, gives results in twenty-four hours. The tests for strength, fineness, and in fact, for all the characteristics of cement, are enumerated. "Overlimeing" is perhaps the most disastrous defect, although one tolerably easy to test for. The author suggests a form of specification to be used in obtaining quotations from makers, also a form of guarantee that the cement to be supplied contains no Kentish rag, slag, or other adulterant. No doubt every builder should purchase his cement with these safeguards. Architects are usually satisfied with such guarantee as the maker's name on sacks and casks affords, and this protection is of real value in view of recently published trade returns disclosing an increasing importation of foreign cement, due to cheap freights from Antwerp. The information in this book of as many pages as there are pounds in a bushel of good cement is printed in readable type on paper suggestively edged with gold and appropriately bound in a cement-coloured cover; the whole, no larger than a dainty lady's Prayer Book, is convenient, as the preface states, for the pocket; an advantage, alas! only to be enjoyed by those who are solely or largely cement users or buyers.

SYDNEY B. BEALE.

LEGAL.

Contract: Provisional Sums mentioned in Specification: Liability of Building-Owner.

HOBBS *v.* TURNER.

This was an appeal by the defendant from the judgment of Mr. Justice Kennedy, reported in 17 *The Times* Law Reports, 83. The appeal was heard in the Court of Appeal on the 17th January, before the Master of the Rolls, Lord Justice Romer, and Lord Justice Mathew. The following report is from *The Times* of the 18th January:—

The plaintiff, who was a metal-worker, sued the defendant, a building-owner, for £27 10s., for metal-work supplied for a house which the defendant was having built for him by a builder under the supervision of Mr. J. L. Williams as architect. The contract under which the house was being built was made in September 1898, and was in the form settled and issued by the Royal Institute of British Architects. By the contract the builder, in consideration of a sum of £4,700, agreed, upon and subject to the conditions in the schedule to the contract, to execute and complete the works described in the specification. Payment for the work was to be made by instalments as the work progressed, according to the certificate of the architect. Clause 28 of the contract, so far as material, was as follows:—"The provisional sums mentioned in the specification for materials to be supplied or for work to be performed by special artists or tradesmen, or for other works or fittings to the building, shall be paid and expended at such times and in such amounts and to and in favour of such persons as the architect shall direct, and sums so expended shall be payable by the contractor without discount or deduction or . . . by the employer to the said artists or tradesmen. The value of works which are executed by the contractor in respect of provisional sums, or in additional works, shall be ascertained as provided by clause 13. At the settlement of the accounts the amount paid by the contractor to the said artists or tradesmen, and the said value of such works executed by the contractor, shall be set against all such provisional sums or any sum provided for additional works, and the balance . . . shall be added to or deducted from the contract sum. . . ." The specification contained this clause:—"Provide and fix iron balcony railings to design (allow £20 for this irrespective of carriage, fixing, and profit)." It was not suggested that there was anything in the specification to alter the legal rights of the parties. The architect selected the plaintiff as the person to supply the iron-work for the balconies, and the builder asked the plaintiff to send designs to the architect, who rejected them, and sent the plaintiff his own designs; and the builder having given measurements and quantities, the iron-work was sent to him (the builder), and the goods were invoiced and debited to him. Later on, in November 1899, the builder wrote to the plaintiff asking him to send him his account, and he did so; but on December 9 the builder wrote saying that the architect would certify the amount direct to the building-owner (the defendant), and on 14 December 1899 the architect sent to the plaintiff a certificate addressed to the defendant certifying that the plaintiff was entitled to be paid £27 10s. for the iron-work. This certificate the plaintiff sent to the defendant, who kept it, making no reply. After this the plaintiff

sent two or three times to the defendant for the money, of which the defendant took no notice. In October 1900, when the plaintiff's solicitor wrote for payment, the defendant repudiated liability. The defendant alleged that he had a claim against the builder for bad work. Mr. Justice Kennedy gave judgment in favour of the plaintiff. The defendant appealed.

Mr. Clavell Salter appeared for the defendant; Mr. Arthur Powell, for the plaintiff, was not called upon.

The Court dismissed the appeal.

The Master of the Rolls said that, in his opinion, the appeal should be dismissed. The contract was one which was not an unusual one at the present time—namely, the builder undertook to do certain portions of the work, and as to the other portions of the work provisional sums were specified. The specification contained this clause:—"Provide and fix iron balcony railings to design (allow £20 for this irrespective of carriage, fixing, and profit)." That threw them back upon the original central undertaking of the builder contained in the contract and the conditions. In consideration of the sum of £4,700 the builder agreed to execute and complete, subject to the conditions in the schedule to the contract, the works described in the specification. In the conditions and specification they found how that lump sum was to be distributed. They found that the builder was not necessarily to execute the whole of the work, but the building-owner might get other persons to do certain parts of the work, and as against the builder certain fixed sums only were to be paid out of the lump sum to those persons for that particular class of work. It was good sense that a sum should be fixed for each class of work which was not to be executed by the builder, but by some tradesman or artist designated by the architect. The building-owner—the defendant—had a discretion as to the person by whom this class of work was to be done, and he might agree to pay him any sum he pleased, but he could only allow as against the builder the fixed sum for each class of work. That being so, clause 28 of the conditions seemed to him to contemplate payment for this class of work being made either by the builder or by the building-owner, and the last part was based on the hypothesis that part of the work might be done by the builder and part not done by him, and where any such work was not done by the builder the building-owner would be entitled to hold back the amount specified for that work. This clause was obviously framed upon the footing that the building-owner was liable for this particular class of work. In his opinion, when one looked at the whole of the contract taken together, and not relying upon any one particular clause, the proper inference as regarded this particular class of work was that it was intended that the building-owner, and not the builder, should be the principal. If the builder entered into a contract for any of this class of work he might make himself liable to the tradesman or artist; but, as he was acting under the general scope of the contract, he would be acting as the agent of the building-owner, and would create privity of contract between the building-owner and the tradesman or artist. That could only be got rid of by the tradesman or artist contracting with the builder in such a way as to debar himself from resorting to the building-owner. Nothing of that kind occurred here. What happened was that the plaintiff was put into relation with the defendant through the architect, and, though this was not clear, he understood that the order was given to the plaintiff by the architect. It was true that the invoice was sent to the builder, but the architect gave a certificate against the defendant, and not against the builder, and sent it to the defendant. His Lordship did not intend to say anything about the point as to e-toppel, nor was it necessary to decide whether, under clause 28 of the conditions, the architect had authority to determine who was to pay as well as to whom payment should be made. It seemed to him, looking at the contract as a whole, that the initial liability of the defendant—the building-owner—in respect of this class of work was established, and that all the parties dealt upon that footing. The judgment was, therefore, right.

Lord Justice Romer agreed.

Lord Justice Mathew was of the same opinion. This was a question of fact which had been properly decided by the learned Judge.

MINUTES. V.

At the Fifth General Meeting (Ordinary) of the Session 1901–1902, held Monday, 20th January 1902, at 8 p.m., Mr. John Slater, B.A. Lond., *Vice-President*, in the Chair, with 22 Fellows (including 10 members of the Council), 30 Associates (including 3 members of the Council), 3 Hon. Associates, and several visitors, the Minutes of the Meeting held 6th January [p. 120] were taken as read and signed as correct.

The decease was announced of John Lee Hodgson, of Lille, Nord, France, *Associate*, elected 1892.

The Hon. Secretary having announced the receipt of five guineas from Mr. Sydney Smirke [*F.*], being his annual donation to the Library Fund, a vote of thanks was passed to Mr. Smirke by acclamation.

The Secretary having read the Deed of Award of the Prizes and Studentships 1902, made by the Council under the Common Seal [p. 143], the sealed envelopes bearing the mottoes under which the successful designs and drawings were submitted were opened, and the names of the authors declared [see DEED OF AWARD, p. 143].

Mr. Detmar Blow having read a Paper on THE ARCHITECTURAL DISCOVERIES OF 1901 AT STONEHENGE, and given a description of the lantern slides shown in illustration thereof, a discussion ensued, in which Sir Norman Lockyer, K.C.B., F.R.S., Mr. Penrose, F.R.S. [*F.*], Mr. Emanuel Green, F.S.A., Mr. W. H. St. John Hope, and the author took part.

On the motion of the Chairman, a vote of thanks having been passed to Mr. Blow by acclamation, the proceedings closed, and the meeting separated at 9.50 p.m.